# FDMC8878

# N-Channel POWERTRENCH® MOSFET

## 30 V, 16.5 A, 14 mΩ

This N−Channel MOSFET is a rugged gate version of ON Semiconductor's advanced PowerTrench process. It has been optimized for power management applications.

### Features

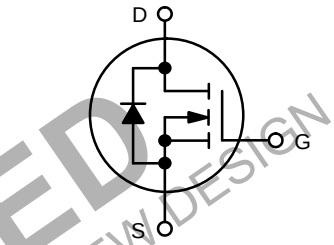
- $R_{DS(on)}$ = 14 mΩ (Max.) @ $V_{GS}$ = 10 V, $I_D$ = 9.6 A
- $R_{DS(on)}$ = 17 mΩ (Max.) @ $V_{GS}$ = 4.5 V, $I_D$ = 8.7 A
- Low Profile − 0.8 mm Max in MLP 3.3 x 3.3
- These Devices are Pb−Free and are RoHS Compliant

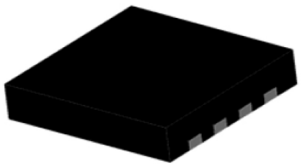
### Application

- DC − DC Conversion

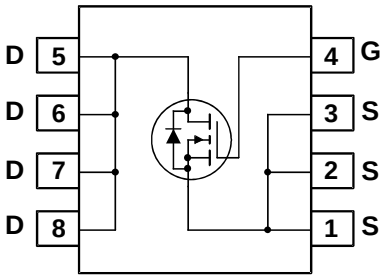
**ON Semiconductor®**

www.onsemi.com



**WDFN8**
**CASE 511DH**




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### MAXIMUM RATINGS ($T_A$ = 25°C unless otherwise noted)

| Parameter | | Symbol | Value | Unit |
|---|---|---|---|---|
| Drain−to−Source Voltage | | $V_{DS}$ | 30 | V |
| Gate−to−Source Voltage | | $V_{GS}$ | ±20 | V |
| Continuous Drain Current | $T_C$ = 25°C (Package limited) | $I_D$ | 16.5 | A |
| | $T_C$ = 25°C (Silicon limited) | | 38 | |
| | $T_A$ = 25°C (Figure 1) | | 9.6 | |
| Drain Current | Pulsed | $I_D$ | 60 | A |
| Power Dissipation | $T_C$ = 25°C | $P_D$ | 31 | W |
| | $T_A$ = 25°C (Figure 1) | | 2.1 | |
| Operating and Storage Junction Temperature Range | | $T_J$, $T_{STG}$ | −55 to +150 | °C |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

### THERMAL CHARACTERISTICS

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Thermal Resistance, Junction−to−Case | $R_{\theta JC}$ | 4 | °C/W |
| Thermal Resistance, Junction−to−Ambient (Figure 1) | $R_{\theta JA}$ | 60 | |

### ORDERING INFORMATION

See detailed ordering, marking and shipping information on page 1 of this data sheet.

### PACKAGE MARKING AND ORDERING INFORMATION

| Part Number | Top Mark | Package | Reel Size | Tape Width | Quantity |
|---|---|---|---|---|---|
| FDMC8878 | FDMC8878 | MLP 3.3 x 3.3 | 13″ | 12 mm | 3000 units |

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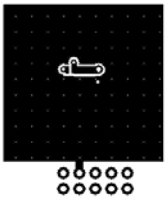

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**ELECTRICAL CHARACTERISTICS** ($T_J$ = 25°C unless otherwise specified)

| Symbol | Parameter | Test Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| $BV_{DSS}$ | Drain−to−Source Breakdown Voltage | $I_D$ = 250 μA, $V_{GS}$ = 0 V | 30 | − | − | V |
| $\Delta BV_{DSS}/\Delta T_J$ | Breakdown Voltage Temperature Coefficient | $I_D$ = 250 μA, Referenced to 25°C | − | 20 | − | mV/°C |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = 24 V, $V_{GS}$ = 0 V | − | − | 1 | μA |
| | | $V_{DS}$ = 24 V, $V_{GS}$ = 0 V, $T_J$ = 125°C | − | − | 100 | |
| $I_{GSS}$ | Gate−to−Source Leakage Current | $V_{GS}$ = ±20 V, $V_{DS}$ = 0 V | − | − | ±100 | nA |
| **ON CHARACTERISTICS** | | | | | | |
| $V_{GS(th)}$ | Gate−to−Source Breakdown Voltage | $I_D$ = 250 μA, $V_{GS}$ = $V_{DS}$ | 1 | 1.7 | 3 | V |
| $\Delta BV_{DSS}/\Delta T_J$ | Gate−to−Source Threshold Voltage Temperature Coefficient | $I_D$ = 250 μA, Referenced to 25°C | − | −5.7 | − | mV/°C |
| $R_{DS(on)}$ | Drain−to−Source On Resistance | $V_{GS}$ = 10 V, $I_D$ = 9.6 A | − | 9.6 | 14.0 | mΩ |
| | | $V_{GS}$ = 4.5 V, $I_D$ = 8.7 A | − | 12.1 | 17.0 | |
| | | $V_{GS}$ = 10 V, $I_D$ = 9.6 A, $T_J$ = 125°C | − | 13.5 | 20.0 | |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$ = 5 V, $I_D$ = 9.6 A | − | 35 | − | S |
| **DYNAMIC CHARACTERISTICS** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$ = 15 V, $V_{GS}$ = 0 V, f = 1 MHz | − | 1000 | 1230 | pF |
| $C_{oss}$ | Output Capacitance | | − | 183 | 255 | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | − | 118 | 180 | pF |
| $R_g$ | Reverse Transfer Capacitance | f = 1 MHz | − | 1.1 | − | Ω |
| **SWITCHING CHARACTERISTICS** | | | | | | |
| $t_{d(on)}$ | Turn−On Delay Time | $V_{DD}$ = 15 V, $I_D$ = 9.6 A, $V_{GS}$ = 10 V, $R_{GEN}$ = 6 Ω | − | 8 | 16 | ns |
| $t_r$ | Rise Time | | − | 4 | 10 | |
| $t_{d(off)}$ | Turn−Off Delay Time | | − | 20 | 36 | |
| $t_f$ | Fall Time | | − | 3 | 10 | |
| $Q_{g(tot)}$ | Total Gate Charge | $V_{GS}$ = 10 V, $V_{DD}$ = 15 V, $I_D$ = 9.6 A | − | 18 | 26 | nC |
| $Q_{gs}$ | Gate−to−Source Gate Charge | | − | 2.8 | − | |
| $Q_{gd}$ | Gate−to−Drain “Miller” Charge | | − | 3.9 | − | |
| **DRAIN−SOURCE DIODE CHARACTERISTICS** | | | | | | |
| $V_{SD}$ | Source−to−Drain Diode Forward Voltage | $V_{GS}$ = 0 V, $I_S$ = 9.6 A (Note 2) | − | 0.8 | 1.2 | V |
| $t_{rr}$ | Reverse Recovery Time | $I_F$ = 9.6 A, di/dt = 100 A/μs | − | 23 | 35 | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | − | 14 | 21 | nC |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

1. $R_{\theta JA}$ is determined with the device mounted on a 1 in$^2$ pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR−4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user’s board design.



a. 60°C/W when mounted on a 1 in$^2$ pad of 2 oz copper

**Figure 1.**



b. 135°C/W when mounted on a minimum pad of 2 oz copper

**Figure 2.**

2. Pulse Test: Pulse Width < 300 μs, Duty cycle < 2.0%.

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## TYPICAL CHARACTERISTICS ($T_J$ = 25°C unless otherwise noted)

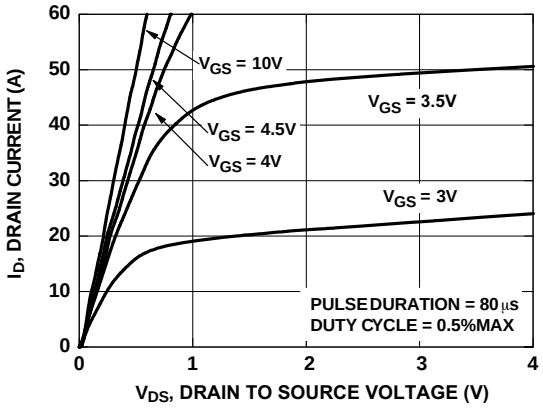



Figure 3. Gate Charge Characteristics

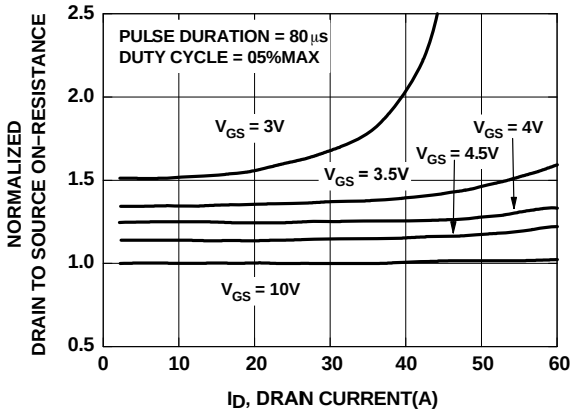



Figure 4. Capacitance vs. Drain to Source Voltage

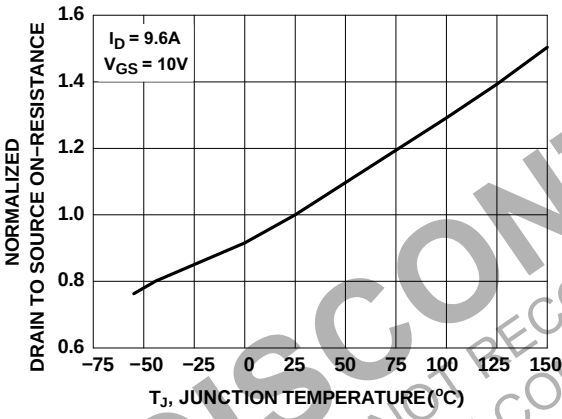



Figure 5. Unclamped Inductive Switching Capability

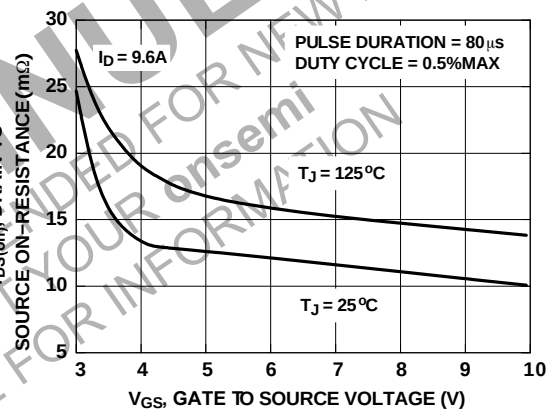



Figure 6. Maximum Continuous Drain Current vs. Ambient Temperature

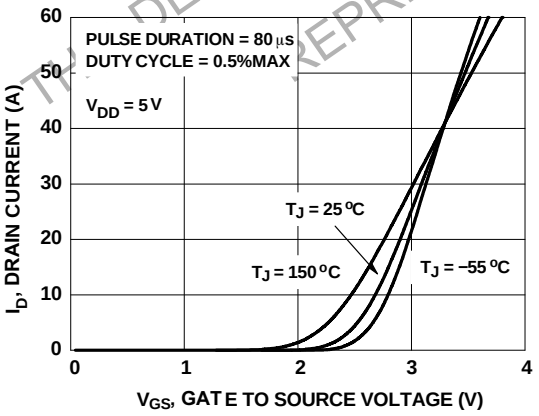



Figure 7. Forward Bias Safe Operating Area

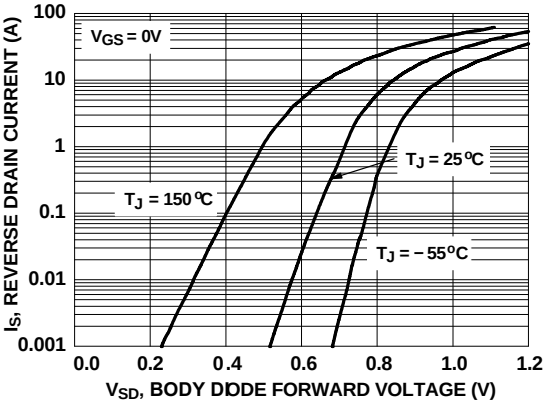



Figure 8. Single Pulse Maximum Power Dissipation

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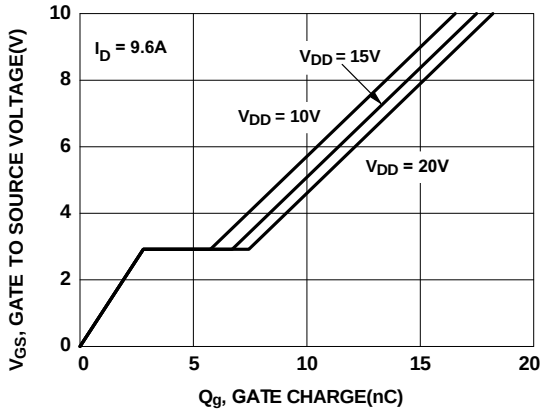



Figure 9. On−Region Characteristics

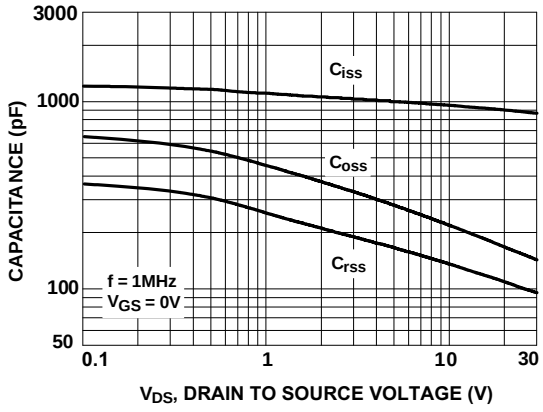



Figure 10. Transfer Characteristics

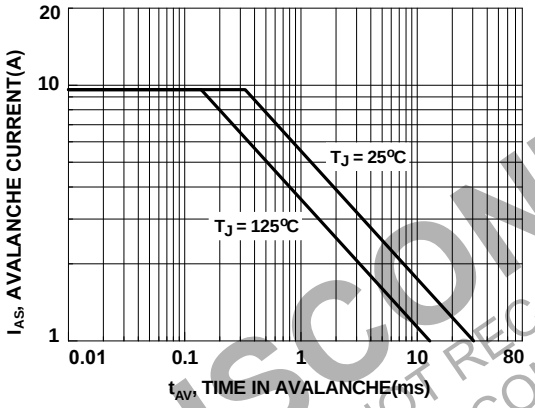



Figure 11. On−Resistance Variation vs. Drain Current and Gate Voltage

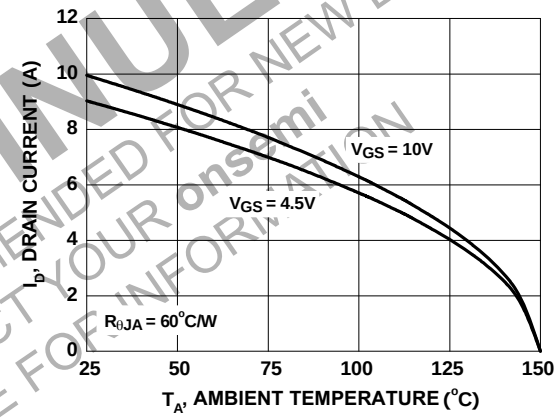



Figure 12. Body Diode Forward Voltage Variation vs. Source Current and Temperature

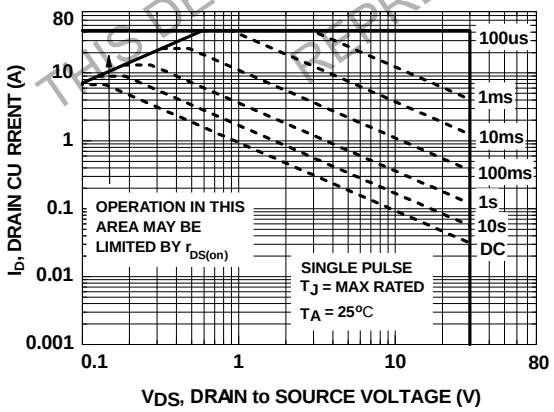



Figure 13. Capacitance Characteristics

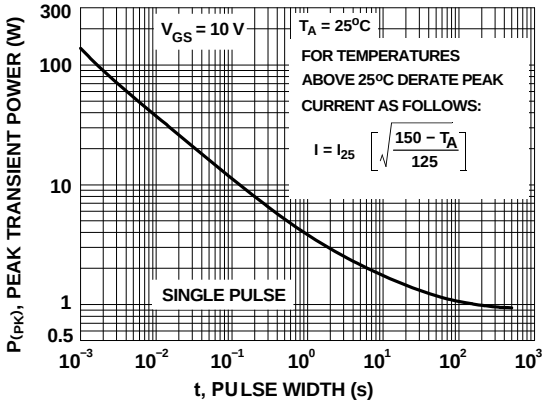



Figure 14. Gate Charge Characteristics

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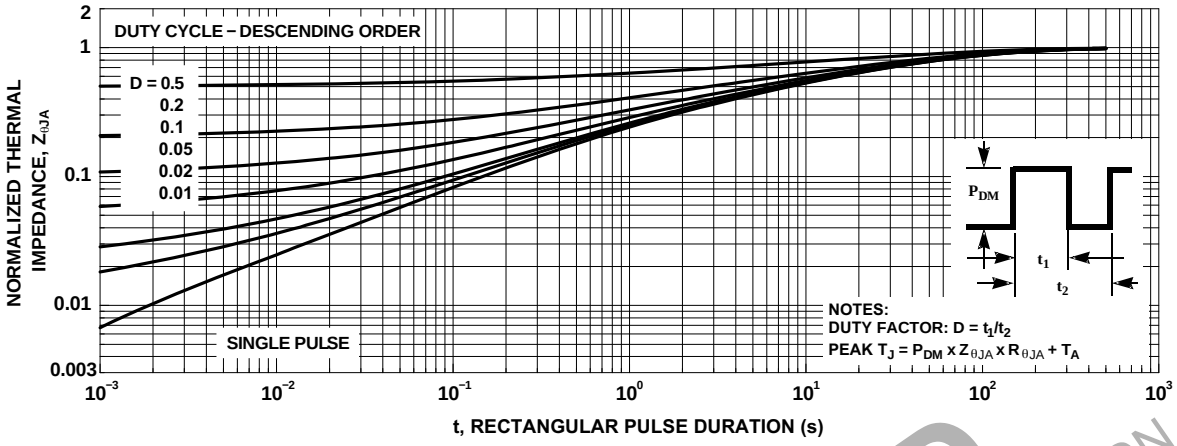


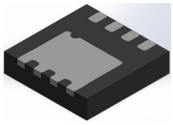

**Figure 15. Transient Thermal Response Curve**

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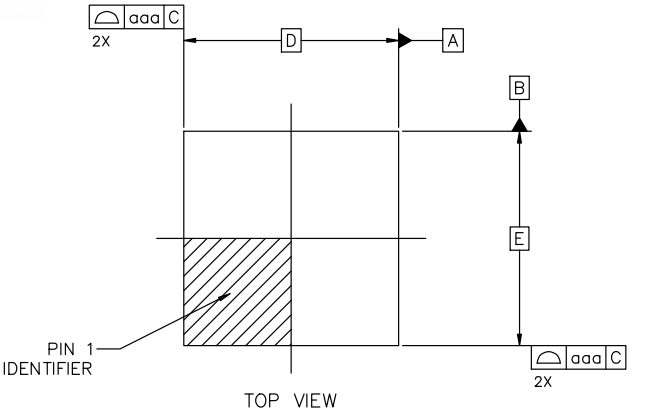


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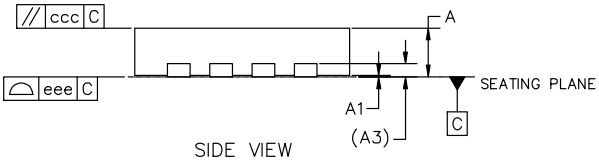


**WDFN−8 3.30x3.30x0.75, 0.65P**
CASE 511DH
ISSUE A

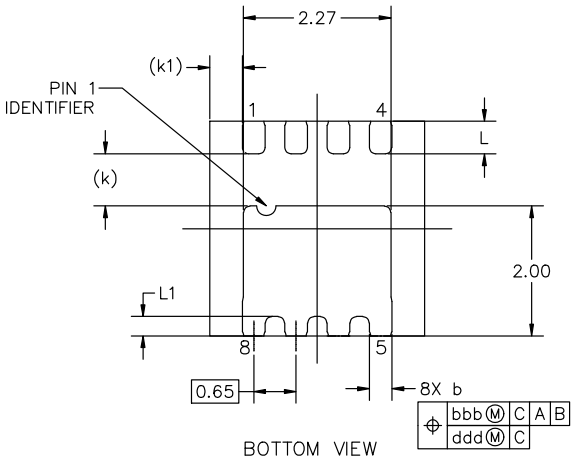
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TOP VIEW



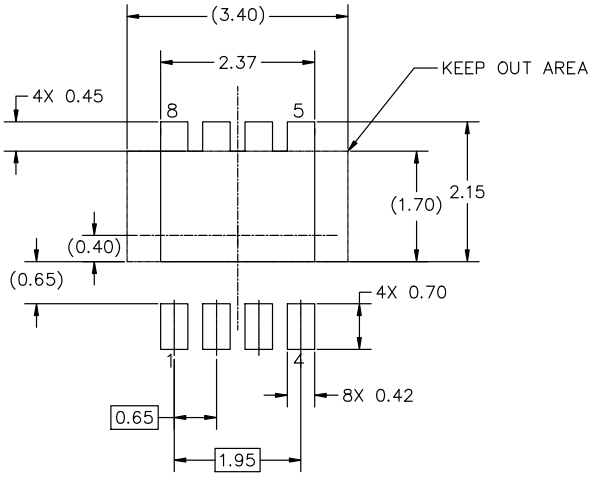

SIDE VIEW




BOTTOM VIEW

NOTES:
1. DIMENSIONING AND TOLERANCING AS PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSION: MILLIMETERS.

| MILLIMETERS | | | |
|---|---|---|---|
| DIM | MIN | NOM | MAX |
| A | 0.70 | 0.75 | 0.80 |
| A1 | 0.00 | 0.025 | 0.05 |
| A3 | | 0.20 REF | |
| b | 0.30 | 0.35 | 0.40 |
| D | | 3.30 BSC | |
| D2 | 2.22 | 2.27 | 2.32 |
| E | | 3.30 BSC | |
| E2 | 1.95 | 2.00 | 2.05 |
| e | | 0.65 BSC | |
| k | | 0.80 REF | |
| k1 | | 0.50 REF | |
| L | 0.45 | 0.50 | 0.55 |
| L1 | 0.25 | 0.30 | 0.35 |
| TOLERANCE FORM & POSITION | | | |
| aaa | | 0.05 | |
| bbb | | 0.10 | |
| ccc | | 0.10 | |
| ddd | | 0.05 | |
| eee | | 0.08 | |




RECOMMENDED MOUNTING FOOTPRINT

* For additional information on our Pb−Free strategy and soldering details, please download the onsemi Soldering and Mounting Techniques reference manual, SOLDERRM/D.

**GENERIC MARKING DIAGRAM***




XXXX = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

| | | |
|---|---|---|
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| **DESCRIPTION:** | **WDFN−8 3.30x3.30x0.75, 0.65P** | **PAGE 1 OF 1** |

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